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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/505,803	02/17/2000	James E Arnold	RA6-021400	7268

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EXAMINER
COMPTON, ERIC B

ART UNIT	PAPER NUMBER
3726	

DATE MAILED: 02/21/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/505,803	ARNOLD, JAMES E	
	Examiner	Art Unit	
	Eric B. Compton	3726	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 December 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *17-23 and 25-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *17-23 and 25-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 17-23, and 25-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of US Patent 5,156,321 to Liburdi et al.

AAPA, as found on pages 1-16 of the specification, disclose various methods of forming (and or repairing) metal products, including the cutting edge of cutting tools, comprising, the following steps: forming a substrate blank to near-finished dimensions, performing pre-coating treatments, coating the substrate with a protective coating, and performing post-coating treatment. Furthermore, it is disclosed that, "Turbine engine airfoil parts, such as vanes, are manufactured to precise tolerances that determine airflow characteristics for the part" (page 16, lines 4-5). Therefore, it is inherent that the dimensional changes, i.e., pre-processed dimensions versus post-processed dimensions, of the part, due to coatings or treatments must be selected precisely and monitored such that the final parts retains precise tolerances. Since, the present

invention is concerned with forming a metal product, rather than repairing or restoring a damaged metal product, the dimensions can be selected up-front.

With regards to coating the metal substrate, it is disclosed that "The coating material layer is formed to build-up the metal component to desired finished dimensions and to provide the finished product with various surface attributes" (page 4, lines 11-12). Prior to coating, it is also known to provide a hot isostatic pressing (HIP) treatment to consolidate the metal powder of the casting (see pages 8-9). A protective coating is then applied, using a high-density coating process, for example a Hyper Velocity Oxyfuel (HVOF) plasma thermal spray process (see pages 6-7). Once coated, the metal part may be subjected to another hot isostatic pressing (HIP) treatment in order to eliminate porosity of the coating and optimize the polycrystalline microstructure (pages 13-15). In a case in which a substrate is coated with a metallic overlay and a high temperature corrosion resistant outer layer, the subsequent HIP treatment was performed to "eliminate porosity and creates an inter-diffusion between the outer layer, the overlay and the substrate" (page 15, lines 6-10). Therefore, as recognized by Applicant, it is known to performed a HIP treatment in order to diffusion bond the coating material to the workpiece substrates.

However, AAPA does not specifically disclose that the edge is capable of being sharpened after the step of coating a metal substrate.

Liburdi et al disclose a method of repairing metal articles. A component is first subjected to a sintering process to prepare the surface. The coated is then coated with a braze alloy. "After the application of the braze alloy, the component is placed under

vacuum or in an inert or reducing atmosphere and heated to a temperature similar to that used for partially s cycle, typically in the range of 800° - 1600°C [1472° - 2912°F], preferably 1000° - 1400°C [1832° - 2552°F]. The temperature is selected to be such that the low melting braze will be liquid, and wet the surfaces of the pores in the previously sintered area. The component is held at temperature for a sufficient interval to promote liquid phase sintering, typically 20 minutes to 24 hours. **Liquid phase sintering is the process by which adjacent particles in a powder mass are consolidated principally by diffusion through a liquid phase present between the particles. The component or fabrication is then cooled to room temperature. The component is then given a suitable heat treatment to develop mechanical properties in the joint and the base metal. Hot isostatic pressing can be used as part of the heat treatment to close any minor internal porosity. Hot isostatic pres**sing is the process of simultaneously exposing the component to high pressure (10-50 KSI) and temperature greater than 1000°C [1832°F]" (col 4, lines 12- 34).

Liburdi et al discloses that the outer edge of the product (e.g. a turbine blade) fabrication or repair is subjected to a grinding process after the sintering and HIP processes, to assume its final dimensions (see page 4, lines 65-66, Examples 5, 7, 8, 9 and 11). This grinding process can be considered analogous to an edge sharpening process. As shown in Figures 2D and 2E, the diffusion bonding between the coating material and the work piece substrate is not detrimentally affected by the grinding process. Additionally, there is no suggestion, whatsoever by Liburdi et al, that bonding would be negatively affected (i.e., flaking and chipping).

Regarding claims 17, 27, and 32, it would have been obvious to one of ordinary skill in the art, at the time of invention, to have performed a edge grinding step after the coating step of AAPA, in light of the teachings of Liburdi et al, in order to form a product having a well defined edge portion.

Further regarding claim 27, AAPA and Liburdi et al do not specifically disclose forming a metal product comprising a kitchen knife. However, it would have been obvious to one of ordinary skill in the art, at the time of invention, to have formed this article using the process disclosed by AAPA/Liburdi et al, since all kitchen knife surfaces are subject to wear and would benefit from having a wear resistant coating.

Regarding claims 18, 28, and 33, AAPA discloses that a protective coating is then applied, using a high-density coating process, for example a Hyper Velocity Oxyfuel (HVOF) plasma thermal spray process (see pages 6-7).

Regarding claims 19, 29, and 34, The HIP treatment claimed by Applicant is essentially the same HIP treatment disclosed by AAPA. "HIP treatment is used in the densification of cast metal components and as a diffusion bonding technique for consolidating powder metals. In the HIP treatment process, a part to be treated is raised to a high temperature and isostatic pressure. Typically, the part is heated to 0.6 - 0.8 [60 - 80%] times the melting point of the material comprising the part, and subjected to pressures on the order of 0.2 to 0.5 [20 - 50%] times yield strength of the material. Pressurization if achieved by pumping an inert gas, such as Argon, into a pressure vessel. Within the pressure vessel is a high temperature furnace, which heats the gas to

the desired temperature. The temperature and pressure are held for a set length of time, and then the gas is cooled and vented" (see pages 8-9, lines 17-6).

Regarding claims 20, 30, and 35, while Liburdi et al do not specifically note that the sintering process removes trapped gas, by providing a densification step (e.g., sintering) the porosity is nearly eliminated and therefore, any trapped gas that may have been in the void formed by the pores of the material would also be eliminated.

Regarding claim 21, AAPA discloses that the substrate can be a high-speed steel cutting tool surface (page 5, line 1).

Regarding claim 22, 31, and 36, AAPA notes the use of coating such as Carbide, Cobalt, and TiN on cutting tools (page, 5, line 10).

Regarding claim 23, AAPA notes the coating vanes which are made of a nickel or cobalt-based alloy (page 3, lines 3-4) of the step of coating parts including vanes using HVOF or Detonation Gun coating techniques (page 7, line 12).

Regarding claim 25, AAPA notes providing a coating to a cutting tool, such as a drill bit (page 4, lines 18).

Regarding claim 26, AAPA and Liburdi et al do not specifically disclose forming a metal product comprising one of an ice skate blade, snow ski edge, kitchen knife, pen tip, and finishing hook. However, it would have been obvious to one of ordinary skill in the art, at the time of invention, to have formed any of these article using the process disclosed by AAPA/Liburdi et al, since all of these surfaces are subject to wear and would benefit from having a wear resistant coating.

Response to Arguments

3. Applicant's arguments filed December 17, 2002, have been fully considered but they are not persuasive.

Applicant argues that the prior art does not disclose a diffusion bond between the cutting edge and the workpiece substrate in which the diffusion bonding between the coating material and the workpiece substrate retains the wear resistant coating material on the cutting edge portion during an edge sharpening process of the cutting edge portion and during use of the cutting edge portion of the formed metal product.

Liburdi et al discloses that the outer edge of the product (e.g. a turbine blade) fabrication or repair is subjected to a grinding process after the sintering and HIP processes, to assume its final dimensions (see page 4, lines 65-66, Examples 5, 7, 8, 9 and 11). This grinding process can be considered analogous to an edge sharpening process. As shown in Figures 2D and 2E, the diffusion bonding between the coating material and the work piece substrate is not detrimentally affected by the grinding process. Additionally, there is no suggestion, whatsoever by Liburdi et al, that bonding would be negatively affected (i.e., flaking and chipping). Also, it is noted by Liburdi et al that problems with the prior art and clearing resulted in joint failure (col. 1, lines 27-45). Thus, it would seem that the invention of Liburdi et al alleviates the problems of the prior art.

The combination of AAPA and Liburdi et al has been shown to produce a coating having inter-diffusion bond with the substrate and other robust characteristics.

Therefore, the rejections above are valid.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric B. Compton whose telephone number is (703) 305-0240. The examiner can normally be reached on M-F, 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory M. Vidovich can be reached on (703) 308-1513. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9302 for regular communications and (703) 872-9303 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1148.

ebc
February 20, 2003

GREGORY VIDOVICH
SUPERVISORY PATENT EXAMINER
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